What is claimed:

1. A method for fabricating microneedles, said method comprising:

(a) providing a substrate material;

(b) coating said substrate material with at least one layer of a photoresist material, and patterning said photoresist material with a plurality of microstructures by use of a photolithography procedure; and

(c) separating said patterned photoresist material from said substrate material, thereby creating a microneedle structure from said patterned photoresist material containing said plurality of microstructures.

2. The method as recited in claim 1, wherein said microneedle structure comprises one of: (a) a plurality of solid protrusions, (b) a plurality of hollow protrusions forming through-holes, or (c) a plurality of hollow protrusions forming microcups that do not extend entirely through said hardened second moldable material.

3. The method as recited in claim 1, wherein said photoresist material comprises a first layer and a second layer, said first layer being cured before said second layer is applied, and said second layer being patterned by said photolithography procedure.

4. The method as recited in claim 1, further comprising: applying a layer of acid-dissolvable material between said substrate and said photoresist material at the commencement of said method, and during said step of separating the patterned photoresist material from the substrate, dissolving said acid-dissolvable material as a sacrificial layer.

5. The method as recited in claim 4, wherein said substrate comprises one of a silicon or a metallic substance, said photoresist material comprises SU-8, and said acid-dissolvable material comprises one of PDMS or silicon oxide.

6. The method as recited in claim 4, further comprising: creating break-away microneedles by briefly etching a portion of said plurality of microstructures proximal to a junction between a base structure and protrusions of the patterned photoresist material containing said plurality of microstructures, said base structure and said microstructure protrusions both being constructed of said photoresist material.

7. The method as recited in claim 1, wherein said photoresist material comprises at least two individual layers, a first of said at least two individual layers being patterned with a first plurality of openings that are of a first size, a second of said at least two individual layers being patterned with a second plurality of openings that are of a second size that is larger than said openings of said first size, said first and second plurality of openings being substantially in alignment with one another; and after said separation of the substrate from the patterned photoresist material, said plurality of microstructures comprises a plurality of microneedles having sharp tips.

8. The method as recited in claim 1, wherein said microneedle structure comprises a plurality of individual microneedles that have an aspect ratio of at least 3:1.

9. A method for fabricating microneedles, said method comprising:

(a) providing a substrate material;

(b) coating said substrate material with at least one layer of a photoresist material, and patterning said photoresist material with a plurality of microstructures by use of a photolithography procedure; and

(c) coating said patterned photoresist material with a layer of moldable material that takes the negative form of said plurality of microstructures, and allowing said moldable material to harden using a soft lithography procedure, then separating said hardened moldable material from both said patterned photoresist material and said substrate material.

10. The method as recited in claim 8, further comprising: separating said independent microstructure layer from said hardened moldable material, thereby creating a microneedle array structure that entirely comprises said microstructure layer made of at least one of: an electroplated metal, an electroplated polymer, or an electroplated composite material.

11. A method for fabricating microneedles, said method comprising:

(a) providing a substrate material;

(b) coating said substrate material with at least one layer of a photoresist material, and patterning said photoresist material with a plurality of microstructures by use of a photolithography procedure;

(c) applying a first moldable material onto said patterned photoresist material/substrate and allowing said first moldable material to harden using a soft lithography procedure, then separating said hardened first moldable material from said patterned photoresist material/substrate to thereby create a microstructure; and

(d) applying a second moldable material onto said microstructure, and after hardening of said second moldable material, separating said hardened second moldable material from said microstructure, thereby creating a microneedle structure from said hardened second moldable material having the three-dimensional negative form of said microstructure.

12. The method as recited in claim 11, wherein said microneedle structure comprises one of: (a) a plurality of solid protrusions, (b) a plurality of hollow protrusions forming through-holes, or (c) a plurality of hollow protrusions forming microcups that do not extend entirely through said hardened second moldable material.

13. The method as recited in claim 12, further comprising a polishing or grinding procedure to open one end of said plurality of microcups, thereby creating a plurality of hollow protrusions forming through-holes.

14. The method as recited in claim 11, further comprising the step of applying an electrically conductive substance through said mask onto a surface of said microneedle array structure, thereby creating at least one pattern of electrically conductive pathways on said surface.

15. The method as recited in claim 9, further comprising: hardening a tip of a plurality of microneedles formed of said microstructures.

16. The method as recited in claim 15, wherein said tip is hardened by adding carbon fibers, or by adding a composite material.

17. The method as recited in claim 9, further comprising: applying said plurality of microneedles to skin, wherein said plurality of flexible microneedles breaks away from a base structure of said microstructures and thereby remaining within a stratum corneum of said skin after said base structure is removed, and wherein said plurality of flexible microneedles are

hollow; applying at least one time a liquid through said plurality of flexible hollow microneedles and thereby through said stratum corneum; and leaving said flexible hollow microneedles in said stratum corneum over a time duration.

18. A microneedle structure, comprising: a longitudinal element having a first end and a second end, said longitudinal element having a side wall extending between said first end and said second end; and said side wall having at least one external channel running between substantially said first end and said second end.

19. The microneedle structure as recited in claim 18, further comprising: a base member; wherein said first end comprises a tip of said microneedle structure, and said second end is attached to or integral with said base member.

20. The microneedle structure as recited in claim 19, further comprising: a longitudinal channel in said base member; wherein said at least one external channel is in fluidic communication with said longitudinal channel.

21. The microneedle structure as recited in claim 20, further comprising: a sensor device located proximal to or integral with said base member, wherein said longitudinal channel is in fluidic communication with said sensor device.